UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/638,707	10/01/2012	Michael Cardinale	2010P00296WOUS	4876

24737 7590 11/17/2017

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
465 Columbus Avenue
Suite 340
Valhalla, NY 10595

EXAMINER
FLORY, CHRISTOPHER A

ART UNIT	PAPER NUMBER
3762	

NOTIFICATION DATE	DELIVERY MODE
11/17/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patti.demichele@Philips.com
marianne.fox@philips.com
katelyn.mulroy@philips.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MICHAEL CARDINALE and SOPHIA ZHOU[1]

Appeal 2016-002804
Application 13/638,707
Technology Center 3700

Before ULRIKE W. JENKS, TAWEN CHANG, and
TIMOTHY G. MAJORS, *Administrative Patent Judges*.

CHANG, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) involving claims to a diagnostic system for displaying ECG lead signal data, which have been rejected as obvious and as directed to patent-ineligible subject matter under 35 U.S.C. § 101. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

STATEMENT OF THE CASE

Two kinds of stress exams are commonly used to evaluate cardiac performance. (Spec. 1:7–9.) "In a stress echocardiogram study, . . . the

---

[1] Appellants identify the Real Party in Interest as Koninklijke Philips Electronics N.V. (Appeal Br. 3.)

heart is imaged ultrasonically" during exercise and resting stages (*Id.* at 1:9–13, 19–21.) In an electrocardiogram (ECG) stress exam, "the ECG lead signals are likewise recorded during both resting and exercise stages" and "analyzed for ST-elevation indicative of myocardial infarction."[2] (*Id.* at 1:34–2:2.)

"In many cases the stress echo and stress ECG studies are combined," and "[t]he clinician will . . . review the information gathered by both techniques, looking for electrical changes and differences in the ECG data and motion and anatomical changes and differences in the ultrasound images." (*Id.* at 2:11–16.) According to the Specification, "[o]ne technique for viewing ultrasonic image assessment of wall motion and myocardial thickness is to display the data on a bullet scorecard," in which "different segments of concentric circles relate to specific sections of the myocardium," "[m]easurements of the diagnosed parameters can be entered on the different scorecard segments," and "segments [may be] color-coded in accordance with the diagnostic data." (*Id.* at 2:22–35.) The Specification states that "[i]t would be desirable to provide a similar presentation of ECG

---

[2] As Andersen, US 2011/0184692 A1, published Jul. 28, 2011 ("Andersen"), explains:

> Different parts of the ECG (called 'waves' or 'segments') represent different parts of the cardiac activation cycle. . . . [T]he common nomenclature is P, Q, R, S, T, and U.
>
> The part of the ECG between the end of the S wave and the beginning of the T wave is called the ST segment. . . . Under normal, healthy conditions the ST segment should approximate an isoelectric line at zero voltage. Any deviation from zero is called ST deviation. If the value is larger than zero, it is called ST elevation, and any value smaller than zero is called ST-depression."

(Andersen ¶¶ 6–7.)

data" where "the presentation [is] comparable to the ultrasound bullet scorecard," and sets out to describe "a bullseye chart for ECG data, particularly ST elevation data." (*Id.* at 3:7–10.)

Claims 1–4 and 6–15 are on appeal. Claims 1 and 10 are illustrative and reproduced below:

> 1. A diagnostic system for displaying ECG lead signal data which provides an anatomical guide to the location of a possible infarction comprising:
>
> a device which is a source of ECG lead signal data containing ST elevation/depression values; and
>
> a display device, responsive to the ECG lead signal data and adapted to produce an image of a bullseye chart comprising the ECG lead data with one or more segments of the chart annotated with ST elevation/depression values from the ECG lead data,
>
> wherein the bullseye chart comprises concentric circles, each circle representing a different level of the heart in relation to the apex, with each circle divided into segments, each segment representing a different circumferential region of the heart.
>
> 10. The diagnostic system of Claim 1, further comprising:
>
> a source of cardiac performance data derived from an ultrasound image;
>
> a bullet scorecard having segments relating to different regions of the heart,
>
> wherein segments of the bullet scorecard are annotated with the ultrasound image-derived cardiac performance data;
>
> wherein segments of the bullseye chart are annotated with ECG lead signal data; and
>
> wherein the display device is adapted to produce an image of both the annotated bullet scorecard and the annotated bullseye chart.

(Appeal Br. 17, 18 (Claims App.) (formatting modified for clarity).)

The Examiner rejects claims 1–4 and 6–15 as being directed to patent-ineligible subject matter under 35 U.S.C. § 101. (Final Act. 2.)

The Examiner rejects claims 1–4, 6–11, 13, and 14 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Roundhill[3] and Andersen. (Final Act. 3.)

The Examiner rejects claim 12 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Roundhill and Andersen, or alternatively further in view of either Matsumoto[4] or Salgo.[5] (Final Act. 7.)

The Examiner rejects claim 15 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Roundhill, Andersen, and Grunwald.[6] (Final Act. 8.)

I.

Issue

The Examiner has rejected claims 1–4 and 6–15 as being directed to patent-ineligible subject matter under 35 U.S.C. § 101. The Examiner finds that "[t]he claim(s) is/are directed to the abstract idea of implementing a well-understood, routine, and conventional practice (e.g., displaying ECG data in a desired visual organization) on a generic computer structure (e.g., a generic source and a generic display)." (Final Act. 2.) The Examiner further finds that

> [t]he additional element(s) or combination of elements in the claim(s) other than the abstract idea per se amount(s) to no more than: instructions to implement the idea on a computer, and/or the recitation of generic computer structure that serves to perform generic computer

[3] Roundhill et al., US 6,447,453 B1, issued Sept. 10, 2002.
[4] Matsumoto, US 2005/0008209 A1, published Jan. 13, 2005.
[5] Salgo et al., US 2009/0136109 A1, published May 28, 2009.
[6] Grunwald et al., US 2009/0005675 A1, published Jan. 1, 2009.

> functions that are well-understood, routine, and conventional practices known in the medical industry.

(*Id.*)

Appellants contend that claim 1, the only independent claim, is not directed to an abstract idea under *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S.Ct. 2354 (2014) and does not "'tie up'" any abstract idea or patent "'the building blocks of human ingenuity.'" (Appeal Br. 9–10, 11.) Appellants contend that, even if claim 1 were directed to an abstract idea, the additional limitations in claim 1 amount to "significantly more" than the abstract idea itself. (*Id.* at 10.) Finally, Appellants contend that "[t]he lack of any single disclosing prior art reference is evidence that the [c]laim 1 invention as a whole describes an apparatus that is none of well-understood, routine, or conventional." (*Id.* at 11.) Appellants contend that claim 10 is further patentable because it recites additional elements that further distinguish the claimed invention from a "'generic computer,'" "improve the clinician's ability to quickly and accurately diagnose a cardiac condition," and render the apparatus of claim not "well-understood, routine, or conventional." (*Id.* at 11–12.)

Appellants do not separately argue claims 2–4, 6–9, and 11–15. Accordingly, we limit our analysis to claims 1 and 10. The issues with respect to this rejection are whether claims 1 and 10 are directed to an abstract idea without significantly more.

Analysis

Claim 1

The Supreme Court in *Alice* reiterated the two-step framework previously set forth in *Mayo Collaborative Services v. Prometheus*

Laboratories, Inc., 566 U.S. 66, 77–80 (2012), "for distinguishing patents that claim laws of nature, natural phenomena, and abstract ideas from those that claim patent-eligible applications of those concepts." *Alice*, 134 S. Ct. at 2355.

The first step in the analysis is to "determine whether the claims at issue are directed to one of those patent-ineligible concepts," e.g., to an abstract idea. If the claims are not directed to an abstract idea, the inquiry ends. Otherwise, the inquiry proceeds to the second step where the elements of the claims are considered "individually and 'as an ordered combination' to determine whether the additional elements 'transform the nature of the claim' into a patent-eligible application." *Alice*, 134 S. Ct. at 2355 (quoting *Mayo*, 566 U.S. at 78, 79.)

Under the analytical framework set forth in *Mayo* and *Alice*, we find that claim 1 is directed to a judicial exception without significantly more and, thus, not patentable under 35 U.S.C. § 101. Turning to the first step of the eligibility analysis, we agree with the Examiner that the claims at issue are drawn to the concept of organizing ECG data into a particular visual format (i.e., a bullseye chart). The Federal Circuit, however, has ruled that claims covering the collection, analysis, and display of data are directed to abstract ideas. *See, e.g., Elec. Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350, 1351–54 (Fed. Cir. 2016); *Digitech Image Tech., LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1350–1351 (Fed. Cir. 2014).

Additionally, we find that the limitations of claim 1 relating to annotating a bullseye chart with the ST elevation/depression values from ECG lead data may be performed strictly in the human mind. (*See, e.g.*, Spec. 2:12–21 (stating that a clinician will often make comparisons and look

for correlations between data from stress echo and stress ECG studies by "glancing from [ultrasound images] to [ECG data]")). Our reviewing court "ha[s] treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category." *Elec. Power Group,* 830 F.3d at 1354.

Appellants contend that claim 1 is not directed to an abstract idea under *Alice*, because (1) it does not recite any mathematical relationship or formula and (2) it recites "much more than merely 'putting data into a presentable form,'" in that "[t]he particular recited presentation is a unique device output . . . that quickly draws the attention of the clinician to a specific heart region." (Appeal Br. 9.) Appellants also contend that the invention of claim 1 does not "'tie up'" any abstract idea or patent "'the building blocks of human ingenuity.'" (*Id.* at 9–10, 11.)

We are not persuaded. Reciting a mathematical relationship or formula is not a prerequisite to finding a claim directed to an abstract idea. *See, e.g., Elec. Power Group*, 830 F.3d at 1354 (analyzing information "by steps people go through in their minds" is within abstract-idea category); *In re TLI Commc'n LLC Patent Litig.*, 823 F.3d 607, 613 (Fed Cir. 2016) (abstract idea exception encompasses "inventions pertaining to methods of organizing human activity"). Likewise, the fact that an abstract idea (e.g., a certain way of organizing information) may provide an advantage does not necessarily render the abstract idea patent eligible. *Cf. Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S.Ct. 2107, 2117 (2013) (explaining that "[g]roundbreaking, innovative, or even brilliant discovery does not by itself satisfy the § 101 inquiry"). Finally, "[w]hile preemption may signal

patent ineligible subject matter, the absence of complete preemption does not demonstrate patent eligibility." *Ariosa Diagnostics v. Sequenom, Inc.* 788 F.3d 1371, 1379 (Fed. Cir. 2015). To the contrary, "[w]here a patent's claims are deemed only to disclose patent ineligible subject matter under the *Mayo* framework, . . . , preemption concerns are fully addressed and made moot." *Id.*

Having found claim 1 to be directed to an abstract concept under *Alice*'s step 1 analysis, we next address whether the claim adds significantly more to the alleged abstract idea.

We find that claim 1 does not amount to significantly more than an abstract idea. Other than the abstract idea of organizing ECG data in the form of a bullseye chart, claim 1 requires only (1) a device that is a source of ECG data, and (2) a display device that produces the bullseye chart annotated with the relevant ECG data. However, the functions performed by these components—i.e., providing and displaying data—are "'[p]urely conventional." *Alice*, 134 S.Ct. at 2359.

Appellants contend that the additional limitations in claim 1 amount to "significantly more" than the abstract idea itself. (*Id.* at 10.) In particular, Appellants argue that claim 1 recites "a device that is a source of ECG data containing ST elevation/depression values," "a device that is functional to create such ST elevation/depression values," and "a display device that produces the particular displayed bullseye chart information arrangement from such values." (*Id.*) Appellants contend that "the claimed combination of a device with the display device, or the display device alone, recites functionality that is not available in a 'generic computer' alone." (*Id.*)

We are not persuaded. As an initial matter, the claim does not recite "a device that is functional to create . . . ST elevation/depression values" as Appellants appear to allege. Instead, all that is required is "a device that is a source of ECG data containing ST elevation/depression values." Also, we agree with the Examiner that such a device encompasses an electrode, which is routinely and conventionally used to acquire ECG data. (Ans. 3.) Indeed, we find that under the broadest reasonable interpretation "a source of ECG data containing ST elevation/depression values" encompasses a generic computer that stores previously acquired ECG data containing ST elevation/depression values. Requiring such "generic computer implementation fails to transform [an] abstract idea into a patent-eligible invention." *Alice*, 134 S. Ct. at 2352. Likewise, displaying information (i.e., the bullseye chart) is a well-understood, routine, and conventional activity previously known to the art and, like the claims at issue in *Alice*, "does no more than require a generic computer to perform generic computer functions." *Id.* at 2359.

Finally, Appellants contend that "[t]he lack of any single disclosing prior art reference is evidence that the [c]laim 1 invention as a whole describes an apparatus that is none of well-understood, routine, or convention." (Appeal Br. 11.) As discussed above, "[g]roundbreaking, innovative, or even brilliant discovery does not by itself satisfy the § 101 inquiry." *Myriad*, 133 S.Ct. at 2117. Thus, even if the claims were not anticipated or obvious, they may still be patentable-ineligible under § 101.

For at least the reasons above, we are not persuaded that the Examiner erred in rejecting claim 1 under 35 U.S.C. § 101. Thus, we affirm the Examiner's rejection of claim 1 under § 101. Claims 2–4, 6–9, and 11–15,

which were not separately argued, fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

Claim 10

Appellants separately contend that claim 10 is patentable because it recites additional elements that further distinguish the claimed invention from a "'generic computer,'" "improve the clinician's ability to quickly and accurately diagnose a cardiac condition," and render the apparatus of claim not "well-understood, routine, or conventional." (Appeal Br. 11–12.)

We are not persuaded. Claim 10 depends from claim 1 and further recites "a source of cardiac performance data derived from an ultrasound image," a bullet scorecard having segments relating to different regions of the heart and annotated with the ultrasound image-derived data, a bullseye chart having segments annotated with ECG lead signal data, and "a display device . . . adapted to produce an image of both the annotated bullet scorecard and the annotated bullseye chart." (Appeal Br. 18 (Claims App.).)

We find that claim 10 is also directed to an abstract idea under the first step in the *Alice* analysis, namely the concept of organizing ECG and ultrasound-derived data into particular visual formats (i.e., a bullseye chart and a bullet scorecard), for the same reasons as discussed with respect to claim 1. As also already discussed above, the mere fact that an abstract idea may provide an advantage, such as "improv[ing] the clinician's ability to quickly and accurately diagnose a cardiac condition," does not transform the abstract idea into a patent eligible application of that idea.

We likewise find that claim 10 does not add significantly more to the abstract idea for the reasons already discussed with respect to claim 1. In particular, other than the abstract idea of organizing data into particular

visual formats, claim 10 requires only the addition of (1) "a source of cardiac performance data derived from an ultrasound image" and (2) a display device adapted to produce the data in the desired visual format. Under the broadest reasonable interpretation, "a source of cardiac performance data derived from an ultrasound image" encompasses a generic computer that stores previously acquired data. Requiring such "generic computer implementation fails to transform [an] abstract idea into a patent-eligible invention." *Alice*, 134 S. Ct. at 2352. Likewise, as discussed above, using a display to produce and display information (e.g., the bullseye chart and the bullet scorecard) is a well-understood, routine, and conventional activity previously known to the art and, like the claims at issue in *Alice*, "does no more than require a generic computer to perform generic computer functions." *Id.* at 2359. Accordingly, we also affirm the Examiner's rejection of claim 10 under § 101.

II.

Issue

The Examiner has rejected, under pre-AIA 35 U.S.C. § 103(a), claims 1–4, 6–11, 13, and 14 as obvious over Roundhill and Andersen, claim 12 as obvious over Roundhill and Andersen, or alternatively further in view of either Matsumoto or Salgo, and claim 15 as obvious over Roundhill, Andersen, and Grunwald. The same issue is dispositive for each of these rejections; thus, we consider them together.

Regarding claim 1, the Examiner finds that Roundhill "discloses the invention substantially as claimed," but does not "expressly disclose that the ECG lead signal data contain ST elevation/depression values such that the display is annotated with ST elevation/depression values from the data, or

explicitly [teach] that the bullseye chart comprise the ECG lead data." (Final Act. 4.) The Examiner finds, however, that Andersen "teaches that it is known [that] ST elevation and depression data [is] particularly relevant to determining the spatial location and severity of a myocardial ischemia or infarct event . . . and further that the ST elevation data is displayed on a graph comprising concentric circles which may reasonably be considered a bullseye chart." (*Id.*) The Examiner also finds that Roundhill discloses the additional limitations of claim 10. (*Id.* at 7.)

The Examiner concludes that

> [i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system as taught by [Roundhill], with ECG data comprising ST elevation data as taught by [Andersen] since such a modification would provide the predictable results of determining the location and severity of the infarct event, and providing annotation of ST data which is diagnostically helpful in determining the infarct event. As modified, the bullseye chart already disclosed in [Roundhill] would thereby comprise the ECG data and specifically the ST data. Alternatively, the concentric circle graph of [Andersen] could be entirely incorporated into [Roundhill] to meet the claim limitation, which merely relates to the routine display of data in graphical form, and it would be entirely obvious to display the ECG data, or the ultrasound data, or both in a bullseye form or any other graphical display form desired and routinely accessible to one of ordinary skill in the art.

(*Id.* at 4–5.)

Appellants contend that the cited art does not disclose or suggest "displaying ST elevation/depression values within segments of a bullseye chart, as recited by [c]laim 1." (Appeal Br. 14.) Appellants further contend that Andersen teaches using "two two-dimensional renderings of ECG vectors . . . to ascertain a particular region of interest in the heart," while Roundhill teaches "a single display intended to show three dimensions."

(*Id.*) Thus, Appellants contend, a skilled artisan would not be able to "simply substitute one of Andersen's ST 2-D vector values into [Roundhill's] bullseye segment." (*Id.* at 15.) With respect to claim 10, Appellants argue that, since the prior art does not suggest "a segmented bullseye chart of ECG lead signal data," "there is by extension no teaching, suggestion, or motivation for one of ordinary skill in the art to produce and display both an ultrasound bullet scorecard and an ECG bullseye chart together." (*Id.* at 16.)

The issue with respect to these rejection is whether the cited art suggests displaying ST elevation/depression values within segments of a bullseye chart, as recited in claim 1. If so, the additional issue with respect to claim 10 is whether the cited art additionally suggests producing an image of both a bullet scorecard annotated with ultrasound image-derived cardiac performance data and the annotated bullseye chart.

Findings of Fact

1. Roundhill teaches acquiring and segmenting ultrasonic cardiac image information by automatic border detection. (Roundhill Abstract; *see also id.* at 11:12–27.)

2. Roundhill teaches simultaneously acquiring and/or displaying real-time ultrasound image sequence and an ECG trace of the heart cycle. (*Id.* at 2:39–44; *see also id.* at 3:15–24.)

3. Roundhill teaches that "[t]he segmented [ultrasound] information may be presented in a color-coded representation, or entered automatically as qualitative or quantitative measures on a scorecard of cardiac performance." (*Id.* at 1:55–58; *see also id.* at 11:27–57.)

4. Roundhill teaches that "[a] quick method for identifying a region of the heart where more detailed study is required is to score cardiac performance on a symbolic representation of the heart." (*Id.* at 14:35–37.)

5. Figure 15d of Roundhill is reproduced below:

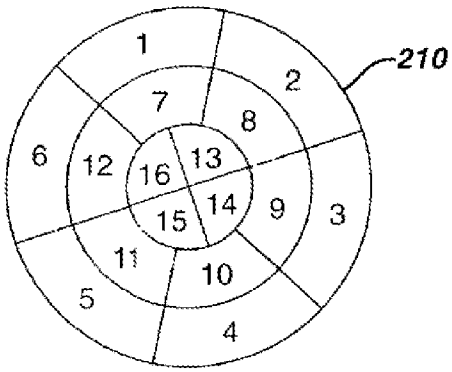

FIG. 15d

Figure 15d of Roundhill is a bullet scorecard based on a symbolic representation of the heart. (*Id.* at 14:37–39.) Referring to Figure 15d, Roundhill teaches that

> The scorecard **210** represents the heart muscle of a chamber of the heart as if the myocardium were spread out in a single plane with the apex at the center of the scorecard and the juncture of the myocardium and the mitral valve plane located around the perimeter of the scorecard. Each sector of the scorecard **210** extending from the center to the perimeter represents a different section of the heart muscle extending from the apex to the mitral valve plane. The areas in the scorecard are numbered to refer to specific areas of the heart wall. . . . The scorecard is filled in automatically using the motion information from the automatically drawn borders to indicate areas of the heart where detailed diagnosis is warranted.

(*Id.* at 14:39–59; *see also id.* at claims 12 & 33.)

6. Andersen teaches that "[t]he ST segment [of the ECG] is of special interest for the diagnosis of myocardial ischemia (lack of oxygen

supply to the cardiac muscle) and related conditions." (Andersen ¶ 7.) In particular, Andersen teaches that

> ST deviations are projections of an ST injury current vector created by areas of myocardial ischemia, which adds to the normal electrical activity of the heart. If the ST injury current flows towards the positive pole of a lead (typical for anterior infarctions), ST elevation will be measured. If the same injury current flows towards the negative pole of a lead (typical for posterior infarctions), ST depression will be measured in the lead. . . . Hence, a more correct diagnosis of myocardial infarction may be obtained by considering ST depression and ST elevation as equivalent electrical phenomena arising from one underlying ST injury current vector. Estimating the ST injury current vector may allow for a more correct diagnosis of myocardial infarction, independent of the lead set used and the location of the ischemic area.

(*Id.* ¶ 10; *see also id.* at ¶ 62.) Andersen teaches that "ST deviations are caused by an underlying ST injury current, that the ST injury current flows towards areas of myocardial ischemia[,] and that ST deviation in any lead indicates myocardial ischemia in an adjacent area of myocardium." (*Id.* ¶ 29; *see also id.* ¶ 65.)

7. Andersen teaches that "spatial distribution of the ST deviations may be used to discriminate between [different types of myocardial infarctions, i.e., ST elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (non-STEMI)], which is important to determine the best choice of treatment." (*Id.* ¶ 11.)

8. Andersen teaches

> [a] system and a method for spatially ordered estimation and visualization of multi-lead electrocardiographic ST deviations induced by myocardial ischemia, in which system a plurality of ECG signals are recorded from a ECG source, which signals are stored by a processor in a memory, which processor processes the signals to obtain ST deviation, which processor performs measurement of ST

> deviation from each lead where the processor performs a multi-dimensional estimation of an vector representing of the spatial direction and magnitude of the underlying cardiac injury-current giving rise to the measured ST deviations, which processor hereby estimates the spatial location and severity of myocardial ischemia.

(*Id.* at Abstract; *see also id.* ¶¶ 25 (graphically display measured ST deviations as spatially ordered vectors and graphically display estimated ST injury current vector), 41.)

9. Andersen teaches that "[t]he ST deviation vectors may be displayed as coordinates, magnitude and angle or similar mathematical representation or displayed graphically in a two-dimensional or three-dimensional form.) (*Id.* at ¶¶ 31, 37.)

10. Andersen teaches that,

> [t]o facilitate reading of the ST deviation vector magnitude each of the two- and three-dimensional coordinate system may include a scale. This scale may be displayed as concentric circles surrounding the origin of the coordinate system. The scale may be chosen to fit with the current diagnostic criteria for the disease in hand-such as millimeter scale or 100-microvolt scale for diagnosis of myocardial infarction. The display may also have direction labels to indicate the anatomical direction of each of the coordinate system axes, e.g. anterior, posterior, lateral, septal, superior and inferior.

(*Id.* ¶ 40.)

11. Figure 2 of Andersen is reproduced below:

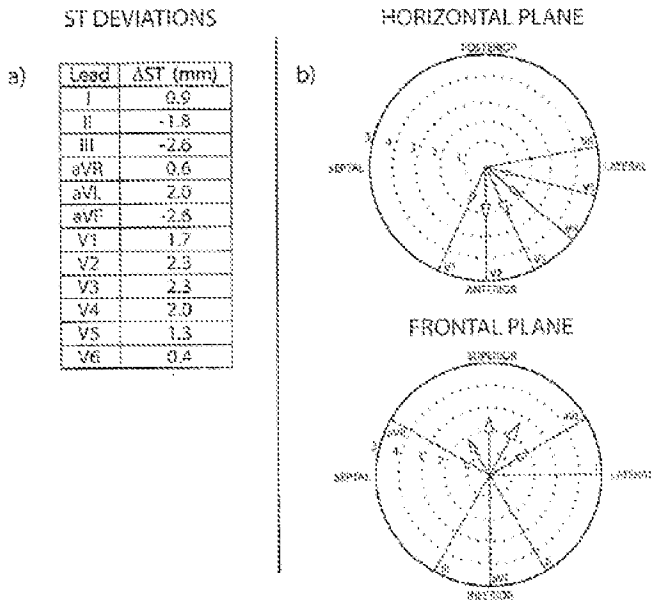

Fig. 2

Andersen's Figure 2 illustrates an "ST Compass" that presents spatial vectors in two 2D planes. (*Id.* ¶ 69.) Andersen teaches that, "[c]onceptually, the centre of the ST Compass . . . located in the centre of the left ventricle" and "denotes 0mm ST deviation," while "[e]ach compass comprises five concentric circles representing 1, 2[,] 3, 4[,] and 5 mm ST deviation (i.e., 0.1–0.5 mV) respectively" (*Id.* ¶¶ 69, 71.) Andersen teaches that for each of the 12 standard ECG lead "the measured ST deviation is indicated with an arrow originating in the centre of the compass and pointing in the direction of the respective lead," where the arrow points to the positive pole of the lead in case of ST elevation and in the opposite direction in the case of ST depression, and "the length of the arrow is determined by the size of the measured ST deviation in the specific lead measured on a continuous scale." (*Id.* ¶ 72.)

12. Andersen also teaches that

> [t]he ST injury current vector estimate may be displayed numerically or in a two- or three-dimensional fashion as described above for the

> display of ST deviation vectors. The display may contain scale and direction labels as described above for the display of ST deviation vectors. . . .
>
> Furthermore, the ST injury current vector estimate may be used to categorize the location and extent of myocardial ischemia. . . .
>
> Furthermore, the direction of the ST injury current vector may be used to categorize the location of a possible ischemic area. . . . One example of such a category could be 'infero-lateral' indicating that the ST injury current vector points in the direction zones defined as inferior and lateral, possibly indicating an area of suspected ischemic myocardium in this region.
>
> Furthermore, the superior-septal direction of the ST injury current vector may be specific for a true non-STEMI condition and may be used to categorize the condition indicated by the ST injury current vector.

(*Id.* ¶¶ 46–49.)

Analysis

Claim 1

We agree with the Examiner that claim 1 is obvious over Roundhill and Andersen. In particular, Andersen teaches a system for displaying ECG lead signal data that provides an anatomical guide to the location of a possible infarction, as well as a source of ECG lead signal data containing ST elevation/depression values. (FF6–FF12.) Likewise, both Roundhill and Andersen suggest display devices capable of producing image of a bullseye chart. (FF3–FF5, FF9–FF12.) Finally, Roundhill teaches a symbolic representation of the heart in the form of a chart comprising concentric circles having the apex as the center, the juncture of the myocardium and mitral valve plane around the perimeter of the chart, and each sector of the chart extending from the center to the perimeter representing "a different section of the heart muscle extending from the apex to the mitral valve

plane." (FF5.) Thus, Roundhill teaches the limitation of a "bullseye chart compris[ing] concentric circles, each circle representing a different level of the heart in relation to the apex, with each circle divided into segments, each segment representing a different circumferential region of the heart." (Appeal Br. 17 (Claims App.).)

We further agree with the Examiner that it would have been obvious to a skilled artisan to annotate the chart disclosed in Roundhill with the ST elevation/depression values discussed in Andersen, because Roundhill teaches a bullseye chart that is a spatial representation of the heart while Andersen teaches that the spatial distribution of the ST deviations is useful in diagnosing, e.g., different types of myocardial infarctions or the spatial location and severity of myocardial ischemia. (FF4–FF5, FF7–FF8, FF12.) A skilled artisan would therefore understand that annotating Roundhill's bullseye chart with the ST deviation information discussed in Andersen facilitates diagnoses relating to myocardial ischemia.

Appellants contend that the Examiner has not established that claim 1 is prima facie obvious over Roundhill and Andersen because it would not be obvious to substitute the "ST Compass" disclosed in Andersen's Figure 2 (FF11) into Roundhill's bullet scorecard to obtain the invention of claim 1. (Appeal Br. 14.) In particular, Appellants contend that Roundhill does not suggest displaying ST elevation/depression values within the segments of a bullseye chart as recited in claim 1 and Andersen does not remedy this deficiency because "Andersen's ST compass is not divided into segments" and thus "fails to include information as to the location within any particular concentric 3-dimensional segment of an ST elevation/depression." (*Id.*) Appellants also contend that Andersen "fails to suggest any display of its ST

values with any particular three-dimensional segment of the heart anatomy." (*Id.*) Appellants further contend that, because "Andersen teaches that two two-dimensional renderings of ECG vectors are viewed to ascertain a particular region of interest in the heart" while Roundhill teaches "a single display intended to show three dimensions, one of ordinary skill in the art would not be able to simply substitute one of Andersen's ST 2-D vector values into its bullseye segment." (*Id.* at 14–15.)

We are not persuaded. We note that

> [t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

In re Keller, 642 F.2d 413, 425 (CCPA 1981). As discussed above, Andersen teaches that the spatial distribution of ST deviations is useful in diagnosing myocardial infarctions and Roundhill teaches using a bullseye chart as a spatial representation of the heart. The combined teachings of the two references would, thus, suggest the invention of claim 1 even if a skilled artisan would not bodily incorporate the "ST Compass" in Andersen's Figure 2 into Roundhill's system. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). Furthermore, contrary to Appellants' contention, Andersen teaches that both ST deviation and ST injury current vector may be graphically displayed in three-dimensional as well as in two-dimensional form. (FF9, FF12.)

Finally, in the Reply Brief, Appellants contend that the Examiner proffered a new ground of rejection in the Answer, i.e., that claim 1 is obvious in view of Roundhill alone because "it would be obvious to one of ordinary skill in the art to swap the heart wall information in Roundhill et al. with [any] desired data set, including ECG information, to arrive at the Claim 1 invention." (Reply Br. 5–6.) Appellants contend that Roundhill "fail[s] to disclose or suggest at least the Claim 1 limitation of 1) a device which is a source of ECG lead signal data containing ST elevation/depression values, and 2) an associated display for displaying such ST elevation/depression values, as recited by Claim 1." (*Id.* at 6.) Appellants contend that, "[w]ithout some suggestion within Roundhill . . . to add these missing limitations, one of ordinary skill in the art would not think to do so" and that the Examiner's rejection is, thus, based on impermissible hindsight. (*Id.* at 6–7.)

We are not persuaded. The Examiner does not suggest that claim 1 is obvious in view of Roundhill alone. (Ans. 5–6 (citing Final Act. ¶ 6.)) Rather, as paragraph 6 of the Final Action makes clear, the Examiner found that it would be obvious to modify Roundhill's bullseye chart to display the ST deviation values discussed in Andersen, because Andersen teaches that these values are "particularly relevant to determining the spatial location and severity of a myocardial ischemia or infarct event" and can be graphically displayed, and because such a modification "would provide the predictable results of determining the location and severity of the infarct event" and be "diagnostically helpful in determining the infarct event." (Final Act. 4.) Thus, Appellants' contention on the alleged deficiency of Roundhill cannot overcome the Examiner's prima facie case of obviousness: "Non-

obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references. . . . [The reference] must be read, not in isolation, but for what it fairly teaches in combination with the prior art as a whole." *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Accordingly, we affirm the Examiner's rejection of claim 1. Claims 2–4, 6–9, 11, 13, and 14, which are not separately argued, fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv). With respect to the rejection of claim 12 as obvious over Roundhill and Andersen, or alternatively further in view of either Matsumoto or Salgo, and the rejection of claim 15 as obvious over Roundhill, Andersen, and Grounwald, Appellants argue only that Matsumoto, Salgo, and Grunwald do not remedy the alleged deficiency of the combination of Roundhill and Andersen in rendering claim 1 obvious. (Appeal Br. 15.) Accordingly, we affirm the Examiner's rejections of claims 12 and 15 for the same reasons already discussed above for claim 1.

Claim 10

With respect to claim 10, Appellants contend that since "Andersen fails to remedy the admitted deficiency of Roundhill . . . to recite a display device which produces a segmented bullseye chart of ECG lead signal data . . . , there is by extension no teaching, suggestion or motivation for one of ordinary skill in the art to produce and display both an ultrasound bullet scorecard and an ECG bullseye chart together." (Appeal Br. 16.)

We are not persuaded. For the reasons discussed above, we find that the combination of Roundhill and Andersen suggests "a bullseye chart comprising the ECG lead data with one or more segments of the chart annotated with ST elevation/depression values from the ECG lead data," as

recited in claim 1. Roundhill also teaches "a source of cardiac performance data derived from an ultrasound image" and a segmented bullet scorecard annotated with the cardiac performance data as recited in claim 10. (FF1, FF3–FF5.) It would be obvious to produce an image of both the bullet scorecard annotated with the ultrasound image-derived cardiac performance data and a bullseye chart annotated with the ECG lead signal data, as both sets of data relate to cardiac performance and such a combination would do no more than yield predictable results of allowing both sets of data to be viewed at once. *KSR Int'l Co.*, 550 U.S. at 416.

SUMMARY

For the reasons above, we affirm the Examiner's decision rejecting claims 1–4 and 6–15.

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED